Last Lecture Summary

- **Components of Relational Model**
  - **data structure**
  - **data integrity**
  - **data manipulation**

- **Codd's Rule**
  - **Rule 0 to 12**

Relational Integrity

- Integrity Constraint is a mechanism to prevent invalid data entry into table to maintain the data consistency.

- Mainly used to provide security and consistency to the database in various operations.

- Types of constraints

  - Domain Integrity Constraint
  - Entity Integrity Constraint
  - Referential Integrity Constraint
  - Enterprise Constraint

Domain Integrity Constraint

- The domain constraint are considered as the most basic form of integrity constraints.

- Domain integrity means it is the collection of valid set of values for an attribute.

- Constraints -
  - Not Null
  - Unique
  - Default
  - Check

Entity Integrity Constraint

Primary Key Constraint –

- It uniquely identify each record in a table
- It does not allow NULL and duplicate values
- Combination of Not Null and Unique

SID	Name	Class (semester)	Age
8001	Ankit	1st	19
8002	Srishti	1st	18
8003	Somvir	4th	22
8004	Sourabh	6th	45
8002	Tony	5th	23

Not allowed as Primary Key Values must be unique

- A relation/table can have only one primary key, which may consist of single or multiple fields.

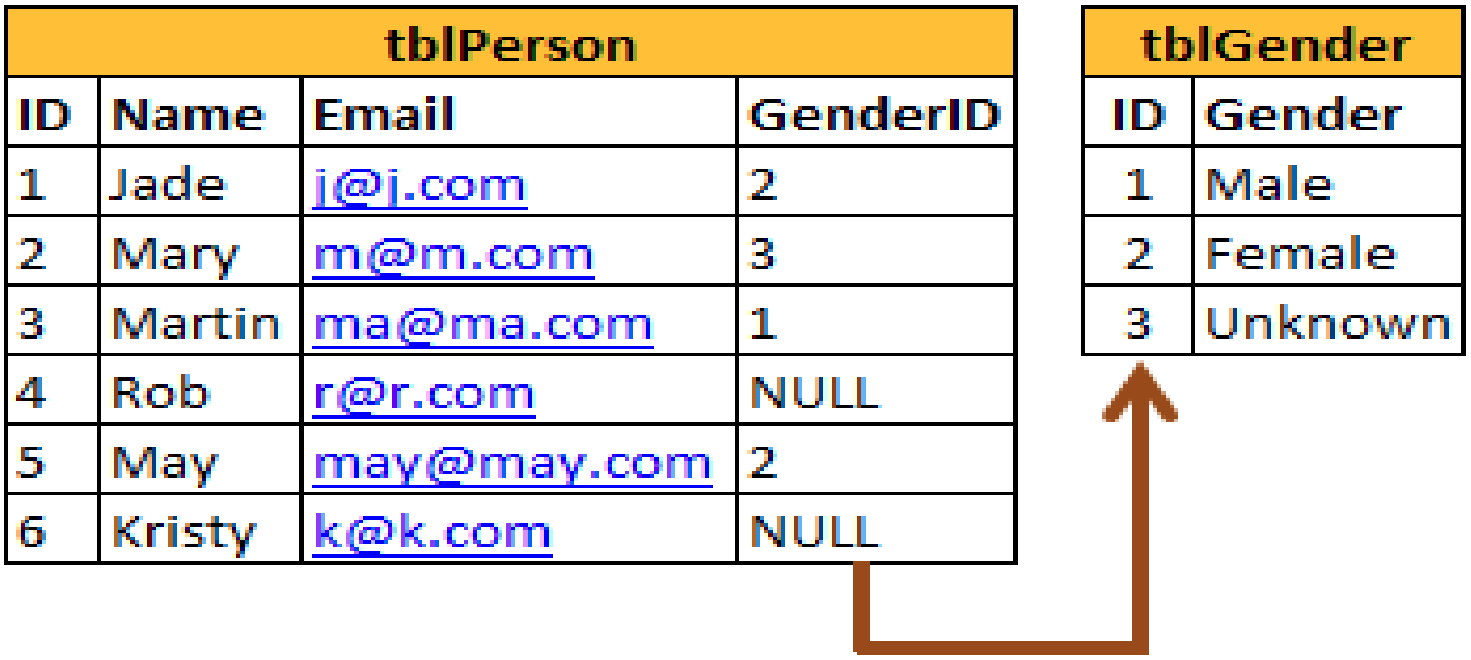
Referential Integrity Constraint

Foreign Key

- A foreign key is an identifier in a table that matches the primary key of a different table.
- The foreign key creates the relationship with a different table, and referential integrity refers to the relationship between these tables.
- It ensures the relationships between tables in a database remain accurate by applying constraints to prevent users or applications from entering inaccurate data or pointing to data that doesn't exist.

Referential Integrity Constraint

For referential integrity to hold in a relational database, any column in a base table that is declared a foreign key can contain either a null value, or only values from a parent table's primary key.



tblPerson

ID	Name	Email	GenderID
1	Jade	j@j.com	2
2	Mary	m@m.com	3
3	Martin	ma@ma.com	1
4	Rob	r@r.com	NULL
5	May	may@may.com	2
6	Kristy	k@k.com	NULL

tblGender

ID	Gender
1	Male
2	Female
3	Unknown

Enterprise Constraint

- It is also referred as Semantic Constraints.
- They are additional rules specified by users or database administrators.
- These rules are depending upon the requirements and constraints of the business for which the database system is being maintained.

- eg. A class can have maximum 30 students
- eg. A teacher can teach maximum 2 subject a semester
- eg. A employee can work on max 5 projects at a time

Relational Database Design

Basic elements of design process:

- Defining the problem or objective
- Researching the current database
- Designing the data structures
- Constructing database relationships
- Implementing rules and constraints
- Creating database views and reports
- Implementing the design

Features of Good Relational Design

- Reduce redundancy
- Easy access to data
- More accuracy and integrity of information
- Data entry, updates and deletions should be efficient.

Bad Database design may lead to:

- Repetition of information
- Inability to represent certain information
- Consist of anomalies – Insertion, Deletion , Updation /Modification

Anomalies

Insert new branch info

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh	40,000	B003	Mumbai
NULL	ABC	45,000	B004	Pune

Insert Anomaly

Anomalies

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh	40,000	B003	Mumbai

Delete Emp_no 117

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi

One branch information is lost

Delete Anomaly

Anomalies

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Delhi
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi
117	Ganesh		03	Mumbai

Update branch_add to Chennai for B002

Emp_no	Name	Salary	Branch_no	Branch_add
105	Mohan	15,000	B001	Calcutta
108	Sohan	21,000	B001	Calcutta
109	Ruchika	29,000	B002	Chennai
115	Sourabh	18,000	B001	Calcutta
116	Mitalee	35,000	B002	Delhi

Require multiple update if not done ?

Update Anomaly